

Planning/
Policy/
System
Information

DECEMBER 2013

Project Title:

Developing a Hydrogen Transportation Infrastructure

Task Number: 2204

Start Date: May 24, 2011

Completion Date: October 31, 2012

Product Category: Improved tool and equipment

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Building California's Hydrogen Highway

Increased fuel capacity allows hydrogen-fuel vehicles to drive longer distances

WHAT WAS THE NEED?

In 2004, Governor Arnold Schwarzenegger issued Executive Order S-07-04 to initiate the California Hydrogen Highway Network. The mission was to ensure that motorists would have access to hydrogen fueling stations along California's roadways. This initiative worked in concert with Assembly Bill 32, the Global Warming Solutions Act of 2006, which established goals and targets to reduce greenhouse gas emissions from all sources throughout California. To help meet these goals, the Schatz Energy Research Center (SERC) at Humboldt State University (HSU) designed and built a hydrogen fueling station to learn about this new technology and demonstrate the potential benefits associated with hydrogen-fueled vehicles. The fueling station began operating in 2008 with a storage capacity of 420 bar (6,000 pounds per square inch). However, newer fuel cell vehicles now have 700-bar storage tanks, increasing the driving range from 200 miles to 400 miles. Upgrading the station's fueling capacity allows vehicles to drive from Arcata to other fueling stations in Sacramento and the San Francisco Bay Area, linking the state's northernmost fueling station to the rest of California's Hydrogen Highway.

WHAT WAS OUR GOAL?

The goal was to upgrade the HSU hydrogen transportation fueling station with a state-of-the-art, 700-bar fueling system to evaluate the station's operational capabilities and analyze vehicle performance in day-to-day use.

HSU hydrogen fueling station



WHAT DID WE DO?

Caltrans, in partnership with SERC, upgraded the HSU station to 700-bar fuel capacity. As part of the fueling upgrade, the researchers designed a safe, code-compliant working space and aesthetically pleasing hydrogen fueling station. To get the hydrogen gas to 700 bar, an additional compressor pumps hydrogen gas from the existing 420-bar storage tank and dispenses the fuel directly into the vehicle's tank to 700 bar. This "slow-fill" method eliminates the need for new, expensive storage vessels. SERC obtained a Fuel Cell Hybrid Vehicle-Advanced (FCHV-adv) from the University of California, Berkeley Transportation Sustainability Research Center to test fuel cell vehicles in day-to-day use. The researchers tracked fill performance data, along with dispensing pressure and ramp rates (the volume per minute rate at which the fuel is dispensed). Additionally, a driving log was used to record driver, vehicle, and refueling information.

WHAT WAS THE OUTCOME?

The station can completely fuel higher capacity vehicles, increasing the commuting distance—the FCHV-adv can now reach the San Francisco Bay Area on a single tank of hydrogen. With hydrogen-fueled vehicles now operating regularly on a key segment of the state's highway system, Caltrans can access travel data and operational information to assess future highway infrastructure needs, vehicle and station performance, and issues concerning hydrogen fuel. This assessment also helps Caltrans decision-makers evaluate the potential use of hydrogen fuel in its own vehicle fleet.



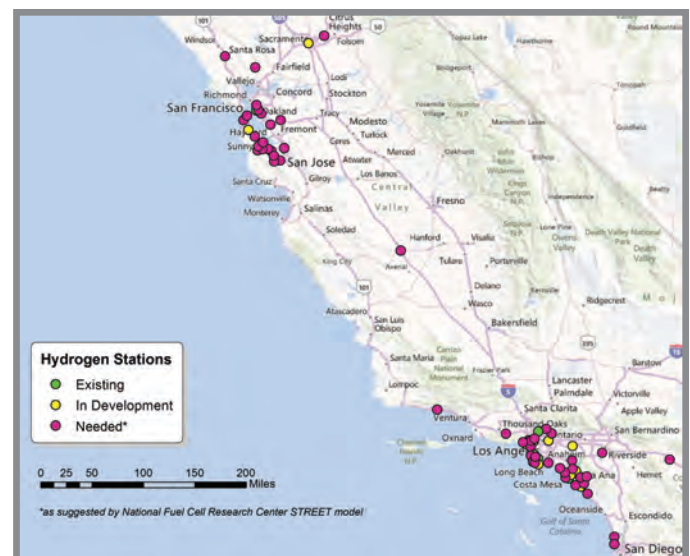
HSU hydrogen fueling station with the Toyota FCHV-adv and hydrogen-powered Prius

WHAT IS THE BENEFIT?

Hydrogen-fueled vehicles can reduce greenhouse gases and potentially provide California with a more efficient and sustainable transportation system. The upgrade of the HSU station helps expand the Hydrogen Highway. The analysis of alternative fuels, vehicles, and the infrastructure that would support them assists Caltrans decision-makers in making effective policy and project choices that will best benefit the state and the traveling public.

LEARN MORE

For more information on the research:
www.schatzlab.org/projects/hydrogen/h2stn.html



California has 13 research hydrogen fueling stations, 9 public stations, and an additional 18 that have been funded and are expected to be operational in the next few years.